Enhanced cellular mobility guided by TiO2 nanotube surfaces.

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Public Summary:

Scientific Abstract:
The in vitro endothelial response of primary bovine aortic endothelial cells (BAECs) was investigated on a flat Ti surface vs a nanostructured TiO2 nanotube surface. The nanotopography provided nanoscale cues that facilitated cellular probing, cell sensing, and especially cell migration, where more organized actin cytoskeletal filaments formed lamellipodia and locomotive morphologies. Motile cell protrusions were able to probe down into the nanotube pores for contact stimulation, and focal adhesions were formed and disassembled readily for enhanced advancement of cellular fronts, which was not observed on a flat substrate of titanium. NOx and endothelin-1 functional assays confirmed that the nanotubes also up-regulated an antithrombic cellular state for maintaining vascular tone. The enhanced endothelial response to TiO2 nanotubes is significant for a potential modification of vascular stent surfaces in order to increase the rate and reliability of endothelialization and endothelial cell migration onto the stent for repairing arterial injury after activation.